Exhibit C

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF WEST VIRGINIA
AT CHARLESTON

IN RE: ETHICON, INC., PELVIC REPAIR SYSTEM PRODUCTS LIABILITY LITIGATION **THIS DOCUMENT RELATES TO WAVE 1 / TVT-O CASES**	**Master File No. 2:12-MD-02327** **JOSEPH R. GOODWIN** **U.S. DISTRICT JUDGE**

RULE 26 EXPERT REPORT OF ANNE HOLLAND WILSON, MBA

I. QUALIFICATIONS

As a Biomedical Engineer and Quality Assurance Consultant, my work focus exclusively on medical devices. My work experience includes extensive experience with permanently implantable devices, as well as reusable devices and disposable devices. My areas of expertise include risk management for medical devices, as well as design controls, quality system development, auditing, and manufacturing process optimization.

I received a Bachelor of Science in Biomedical Engineering from Vanderbilt University in 1985, and a Master of Business Administration from the University of Colorado in 1991.

I currently hold certifications as a Certified Quality Auditor, Certified Quality Engineer, and Certified Quality Manager through the American Society for Quality, a Quality System Lead Auditor through Exemplar and as Registered Quality Assurance Professional in Good Laboratory Practice through the Society of Quality Assurance. I am a Senior Member and served as Chair of the Austin Section of the American Society for Quality in 2004-2005. In addition to the American Society for Quality, I am a member of the American Society for the Advancement of Medical Instrumentation, Regulatory Affairs Professional Society, and the Society of Quality Assurance. I have also guest lectured at universities and industry seminars on topics such as design controls, risk management, and process validation for medical devices.

In 2000, I founded QA Consulting, Inc. where I continue to serve as CEO. I consult with medical device manufacturers to develop and implement compliant solutions for their quality practices. I have completed 100+ supply chain/internal audits to U.S and International Standards. While the 510(k) process is not part of this report, I have been involved in over 30 510(k) applications and am familiar with the requirements relating to FDA clearance of a medical device. The process described herein is not part of the 510(k) process, but instead, part of the Industry standards that medical device companies must follow in designing a safe device for the lifetime of that product.

Prior to creating my company, I worked as a Senior Manufacturing Engineer, QA Manager, and Senior Quality Assurance Engineer over the course of six (6) years with Sulzer Carbomedics of Austin, TX. Prior to those positions, I served as Project Manager and Design Assurance Engineer with Ohmeda Monitoring, Quality Assurance Project Engineer with Cobe BCT, Inc., Quality Assurance Engineer with Fischer Imaging Corporation, and Project Engineer with LA BAC Medical Systems.

My 30 years of experience as a Biomedical Engineer in quality assurance, ranging from design concept and research and development through manufacturing/production and post-market surveillance for Class I, II, and III medical devices has afforded me expert knowledge of medical device industry regulations and standards, including but not limited to Title 21 – Food and Drugs of the Code of Federal Regulations, particularly Section 820, Quality System Regulation, and Section 58, Good Laboratory Practice for Nonclinical Laboratory Studies, as well as ISO Standards 13485, Medical Devices - Quality management systems – Requirements for regulatory purposes, 14971, Medical Devices – Application of risk management to medical devices, and 9001, Quality management systems – Requirements.

My experience, education, and certifications along with a complete list of my publications and presentations are outlined in my Curriculum Vitae attached to this report as Exhibit 1.

II. BACKGROUND

I have been asked to address the design control and risk management processes of Ethicon, Inc., Ethicon Women's Heath and Urology, a Division of Ethicon, Inc., Gynecare, and Johnson & Johnson (collectively referred to as Ethicon) associated with the manufacture of the GYNECARE TVT-O System which is a medical device indicated for treatment of stress urinary incontinence (SUI). The TVT-O device is a kit which includes the same plastic handle material, plastic sheath, and Prolene mesh that are used in the retropubic TVT device.[1] The Prolene mesh used in the TVT-O device is available in both mechanically cut and laser cut options.[2] The TVT-O is sold in a sterile pre-assembled kit.

This report encompasses the timeframe from the development of the TVT-O in 2003 forward, including the introduction of the LCM for the TVT-O and TVT-R (TVT-base) in 2006.[3] All of my opinions expressed in this report are offered to a reasonable degree of professional certainty within my field.

In the course of my work on this case, I analyzed, reviewed, and relied upon documents in the following categories of information, listings of which are provided in Exhibit 3: (a) applicable standards, and guidance documents; (b) Ethicon documents, including, but not limited to, risk management documents and quality assurance documents; and (c) deposition transcripts of Ethicon employees.

[1] Eth.Mesh.00259283 (TVT-O DHF Book 1).
[2] Eth.Mesh.00167119 (6/26/2006 Ethicon Product Pointer).
[3] TVT-R aFMEA and Legacy Reports are included in the Figure 4 and Tables 2 and 3 to show risk related documents for TVT-0 and LCM throughout the life of the product.

In my profession as a Biomedical Engineer and Quality Assurance Consultant for medical device companies, I routinely analyze medical device manufacturers' risk management processes and identify their strengths and weaknesses. I regularly look at medical device companies' design and risk management documents, including design history files (DHFs) and failure mode effect analyses (FMEAs), and evaluate whether that documentation complies with industry standards and practices. For example, I routinely use root cause analysis methodologies to identify the deficiencies in medical device companies' processes such as design control, risk management, production issues, or corrective and preventive actions (CAPAs). These are the same analysis methods that I have performed in the course of my work in this case.

III. SUMMARY OF OPINIONS

A summary of the opinions presented herein is below:

1. During the development of TVT-O in 2003, Ethicon had no overarching, cohesive risk management system in place. Ethicon authored several internal procedures for its risk management process, but conducted it in a piecemeal fashion by leveraging past risk management assessments, rather than looking at the design of the TVT-O device as a whole. Reliance on the TVT-R risk analysis was made in error because it did not take into account the unique applications and use for the TVT-O. In fact the international standard in place during the time that the TVT-O was developed states that risk analysis for similar medical devices should be evaluated, including changes that could influence the various hazards present.[4] A new "inside out" surgical approach, new accessories and needle attachment mechanism should have given rise to creation of a system level risk analysis, risk evaluation and risk controls which are commonly recognized as essential parts of the risk management process.[5] Furthermore, placement of the TVT-O through the obturator space instead of the retropubic space should also have given rise to a wholly new system level risk analysis, risk evaluation and risk controls. This concept, as well as the industry standards, were violated by leveraging the TVT-R analysis and by evaluating the new components (helical passers, winged guides and plastic tubes) and their method of placement separately rather than as an entire system as it would be implanted.

2. The Device Design Safety Assessment (DDSA) is the initial evaluation conducted for all design and design changes at Ethicon. Ethicon's internal procedures required that only the risks with the highest severities (almost severe or critical) be subjected to risk reduction and systematic analysis.[6] That process is flawed because it eliminates the need for a systematic analysis of risk using standard tools such as FMEA. Without these tools, it is not possible to look at the performance of the system as a whole, which violates ISO 14971.

3. Ethicon's risk management was inadequate during the development of the TVT-O. Although many documents were generated, the quantity did not make up for the lack of quality and consistency. There were gaps and a lack of management oversight allowing the system to be inconsistently applied and implemented. Each analysis was done compartmentally which made it impossible to obtain an overall risk profile for the device and allowed for several known risks

[4] ISO 14971:2000 Section 4.1.
[5] ISO 14971:2000/A1:2003.
[6] Eth. Mesh.08438974.

to remain unaddressed. As stated in the TVT-O Risk Assessment Evaluation[7] summarizing the DDSA, the "results of the exercise" showed that all risks were acceptable without use of mitigations, risk controls or the need for a risk benefit evaluation, all of which are industry norms for implementation of risk management International Standards. It appears the risk management activities were more of an effort to fulfill a requirement than to provide a safe product. When a manufacturer does not properly implement risk management efforts, the manufacturer cannot ensure that its products work as intended and are safe for their intended use**.** In this case, Ethicon could not ensure that its TVT-O product was safe for its intended use as a permanent medical implant in a woman's pelvis.

IV. RELEVANT STANDARDS FOR MEDICAL DEVICE MANUFACTURERS

A. RELEVANT INTERNATIONAL STANDARDS GOVERNING QUALITY MANAGEMENT SYSTEMS.

There have been quality management system (QMS) standards applied to many industries prior to the development and implementation of industry specific standards. One of the first standards used was MIL-Q-9858A Quality Program Requirements which was issued April 9, 1959. MIL-Q-9858A was an input to the ISO 9000 series of standards, Quality systems: Specifications for design/development, production, installation and servicing, which were originally implemented in 1987. It is apparent that international standards governing the QMS and associated risk management practices for medical devices pre-date the initial design of the TVT-O. These are industry norms which are not optional to implement. My work with medical device companies involves the application and adherence to these standards. There are other standards that apply, including:

1. ISO 9001-QUALITY SYSTEMS—MODEL FOR QUALITY ASSURANCE IN DESIGN, DEVELOPMENT, PRODUCT, INSTALLATION AND SERVICING AND EN 46001QUALITY SYSTEMS MEDICAL DEVICES-PARTICULAR REQUIREMENTS FOR THE APPLICATION OF 9001

ISO 9001 is a non-industry specific QMS which is utilized either as a stand-alone standard or in conjunction with industry specific requirements such as EN 46001. ISO 9001 defines organizational and management requirements relating to quality processes. The standard is broken into twenty (20) elements which define organizational/management responsibilities, quality system procedures, contract review as well as design controls, process controls, inspection and test methods. Responsibilities for handling of nonconforming product, complaints and corrective and preventive action (CAPA) are also covered.

[7] Eth.Mesh.00259417.

ISO 9001:1994 states that design input requirements relating to the product are to be identified, documented and reviewed, whereas EN 46001 adds a requirement for medical devices to "identify requirements that are related to the *safety* of the medical device and shall include such requirements as design input data."[8] In addition to merely identifying and creating a system that complies with these standards, it is also necessary to ensure that those systems actually work as intended, providing the necessary feedback for patient safety and subsequent action as necessary.

2. ISO 13485 – MEDICAL DEVICES--QUALITY MANAGEMENT SYSTEMS—REQUIREMENTS FOR REGULATORY PURPOSES

ISO 13485 is a medical device industry standard relating to QMS which defines documentation requirements, management responsibilities, human resources, design control, product realization, and measurement analysis and improvement. This standard also defines how a medical device manufacturer should handle complaints and product or system related CAPAs once a manufacturer becomes aware of feedback from any source. ISO 13485 has defined the requirements for proper risk analysis in the medical device industry since 1996. The methods for implementation of risk analysis have been deployed using BS EN 1441 and ISO 14971.

Specific questions are to be addressed during the analysis including, but not limited to, the influence of biodegradation on the material, information on the chemistry of the material, and hazards related to the use and reasonably foreseeable misuse of the device and accessories. BS EN 1441 also requires review of the risk analysis in light of new data as risks change over time.

3. ISO 14971 – MEDICAL DEVICES--APPLICATION OF RISK MANAGEMENT TO MEDICAL DEVICES

ISO 14971 is the primary standard in the medical device industry defining how to perform risk management, and remains the guiding standard today. While ISO 13485 states that risk management is necessary for medical device manufacturers, ISO 14971 sets forth an overview of essential steps to perform risk management as shown in Exhibit 2.

ISO 14971 specifically calls for: a risk management plan; risk management procedure; and residual risk evaluation and overall residual risk evaluation. A key concept of the standards and their implementation is:

"It is accepted that the concept of risk has two components:

a) the probability occurrence of harm;
b) the consequences of that harm, that is how severe it might be."[9]

As shown below, while analysis of a medical device involves multi-disciplinary input, the analysis of the risk posed by the design embodies crucial and basic concepts of patient safety. Key questions must be asked, documented, resolved and reviewed before a medical device

[8] EN 46001:1993 § 4.4.3.
[9] ISO 14971: 2000: Introduction and ISO 14971: 2007 Introduction.

design is deemed complete and in compliance with Industry Standards. To ignore this crucial process is a violation of the design standards.

The initial step in risk management related to medical device design is risk analysis for a specific device and its intended use[10]. For the risk management process to function properly, such that the device's design does not harm people, the team performing the analysis requires "expertise in areas such as:

- how the medical device is constructed;
- how the medical device works;
- how the medical device is produced;
- how the medical device is actually used;
- how to apply the risk management process."

B. RISK PLANNING USING FAILURE MODE EFFECT ANALYSIS

The purpose of risk management is to protect people from physical injury or damage to health. Risk planning is an essential starting point for defining risk management activities. The plan is utilized to identify both the applicable device(s) and associated life cycle phase. The risk management team and their authorities are also to be defined in the plan. Although no specific risk acceptability levels are prescribed, each company is required to responsibly define their criteria for acceptability within the plan and ensure that a process is in place to apply and assess risk control measures. The medical benefit after application of risk control measures must outweigh the residual risk. This is classic risk-benefit analysis. Key to this analysis (the "risk") is actual occurrence of patient harm.

There are several tools that may be utilized to implement risk management activities. These include, but are not limited to, fault tree analysis (FTA), failure mode effect analysis (FMEA), and hazard and operability study (HAZOP). In my experience, of all the risk management tools, the FMEA is utilized most frequently for analysis of risk in medical devices.

The FMEA is a technique by which the consequences of an individual fault mode are systematically identified and evaluated.[11] "Failure modes" means the ways, or modes, in which something, such as a medical device, might fail both under intended use and foreseeable misuse conditions.[12] Failures are any errors or defects, especially ones that affect the customer, and can be potential or actual. "Effects analysis" refers to analyzing the consequences of those failures. The FMEA encompasses the identification of the potential causes of failure, an estimate of their severity, the potential frequency, as well as the potential for these failures to be detected. For every risk that is identified, a manufacturer then has a duty to mitigate the risk as far as possible, meaning that they need to reconsider the design of the product so as to eliminate any potential risks to the fullest extent feasible. This is true for all kinds of medical devices. If risk mitigation cannot occur through product design, a manufacturer must attempt to minimize the risk by incorporating protective measures. A protective measure, in the cases of an implant, could be the addition of an accessory to the kit that makes the surgery more precise or reliable such as a guide

[10] ISO 14971:2000 Section 3.2 and ISO 14971: 2007 Section 3.1.
[11] ISO 14971: 2000: Annex F and ISO 14971: 2007: Annex G.
[12] ISO 14971: 2000 Section 4.2 and ISO 14971: 2007 Section 4.2.

or tool, or a tool to remove the device in the event of a complication. I have worked with medical device companies that have incorporated such protective measures for implantable devices. The manufacturer may also add a warning about the hazards, and provide training to the product's users. Warnings and training are the least effective means of minimizing risks of a product and should only be used as a last option.

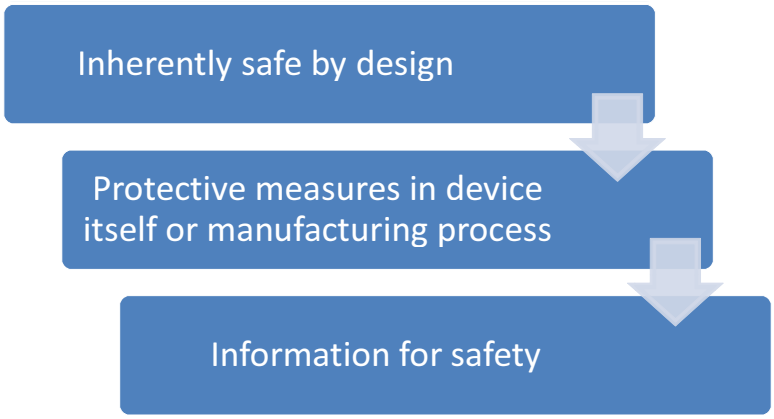

Figure 2: Risk Options[13]

For a FMEA to work, all potential risks must be identified to ensure that the product's design is as robust as possible. If this is not done, the manufacturer cannot ensure that the device will function as intended and the manufacturer cannot ensure the safety of the device in patients.

Traditionally, there are four (4) different types of FMEAs that can be conducted during the risk assessment phase of product development: (1) System (concept) FMEA; (2) Design FMEA (dFMEA); (3) Process FMEA (pFMEA); and (4) Service FMEA (sFMEA).[14] In my experience, manufacturers of non-active permanently implantable medical devices do not conduct sFMEAs because repair and maintenance activities are not anticipated. Instead, an application FMEA (aFMEA) is often conducted in conjunction with the dFMEA to look at potential failures associated with the use and misuse of the product by the end user.[15]

[13] Id.
[14] Failure Mode and Effect Analysis, FMEA from Theory to Execution, D. H. Stamatis, Second Edition, p.40.
[15] Id.

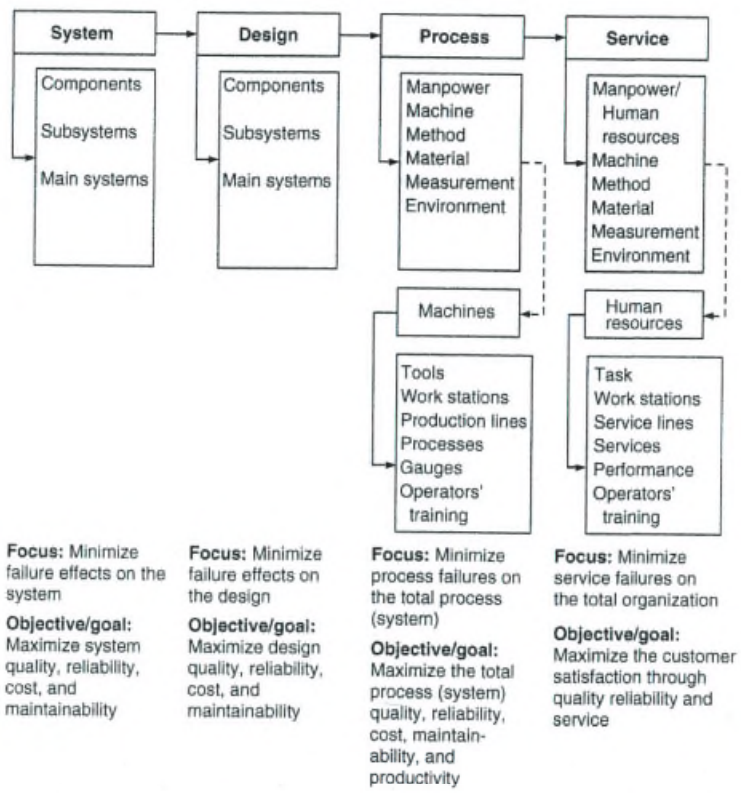

Figure 3: Types of FMEAs[16]

Acknowledging that use of a medical device entails some degree of risk,[17] the dFMEA is conducted during the design phase of product development to ensure any and all product and system related features that could lead to patient harm are identified and designed out of the system to the extent feasible. For product features that could harm a patient, a pFMEA is conducted on the manufacturing process for a new product, and an aFMEA looks at risks associated with the application or a product (such as surgical implant of the device). A FMEA requires the identification of all potential failure modes for a particular product. For each potential failure mode, an estimate is made for its severity (S), or its occurrence rate (O), and its ability to be detected (D).

The "System" FMEA is one of the four (4) types of generally accepted FMEAs. The system FMEA is a predecessor of or may be integrated with the design dFMEA and focuses on failure modes between the system functions (such as the needle, tape and guide) to identify system interactions and deficiencies.[18] System level analyses are critical in that they directly relate to the overall application of the system in its intended use environment rather than only constituent parts. A system level FMEA would consider for example, where a device is inserted, the final placement of the device, instrumentation utilized and instructions for use and/or surgical

[16] Failure Mode and Effect Analysis, FMEA from Theory to Execution, D. H. Stamatis, Second Edition, p.41
[17] ISO 14971: 2000 and ISO 14971: 2007 Medical devices- Application of risk management to medical devices.
[18] Failure Mode and Effect Analysis, D.H. Stamatis, Second Edition, Pg.41.

technique. The goal is to identify the risks associated with the entire system itself when used as intended and with reasonably foreseeable misuse[19] by the medical device manufacturer.

C. ETHICON'S OWN INTERNAL STANDARDS REGARDING RISK MANAGEMENT

Ethicon's own internal risk assessment documents and witnesses confirm that the risk management process is as I have described it. Dan Smith, Ethicon's Corporate Representative for the design and development of Ethicon's Stress Urinary Incontinence (SUI) products, acknowledged that Ethicon's internal policies are actually written to comply with the international standards.[20] At Ethicon, the Medical Affairs department was tasked with being the final "approver" of the risk management process.[21] Testimony of Ethicon engineers has confirmed that the FMEA process is intended to capture "all of the potential risks to a patient's health or safety.[22] Dan Smith, Ethicon's Corporate Representative for the design and development of Ethicon's SUI products acknowledged that Ethicon's risk management tools are supposed to assess known risks.[23]

Aaron Kirkemo, a past Medical Director at Ethicon, testified that once risks are identified, "you will go ahead and if it is an unanticipated event…you need to go back and try to figure out…mitigation strategies."[24] Ethicon employees have also acknowledged that the FMEA "analysis for each product" "should be documented thoroughly within the company."[25] Moreover, Ethicon Regulatory Affairs Manager, Bryan Lisa, has acknowledged that it is possible that if a risk can't be designed out or is too severe to just warn about, is it possible that the device may not be sold.[26] Testimony of Ethicon employees has acknowledged that the dFMEA goes beyond physical properties of the product and also "addressed how the product is going to perform after it's been placed in a body or when it's being placed in a body."[27]

Dan Smith, Ethicon's Corporate Representative for the design and development of Ethicon's SUI products, explained at his deposition that during the design and development of a device, Ethicon used the Device Design Safety Assessment (DDSA) mechanism as described in PR602-003 as the primary tool to assess risk.[28] Dan Smith explained that Ethicon subsequently changed their risk management tool to utilize dFMEA, aFMEA, and pFMEA tools and that this was the equivalent process to using the DDSA.[29]

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[19] ISO 14971: 2000 Section 4.2 and ISO 14971: 2007: Section 4.2.
[20] Deposition of Dan Smith, June 4, 2013, 669:1-6.
[21] Deposition of Bryan Lisa, December 19, 2011, 52:1-6.
[22] Deposition of Scott Ciarocca, March 29, 2012, 97:23-98:21.
[23] Deposition of Dan Smith, May 16, 408:19-21.
[24] Deposition of Aaron Kirkemo, January 6, 2014, 39:14-40:9.
[25] Deposition of Bryan Lisa, December 19, 2011, 49:9-13.
[26] Deposition of Bryan Lisa, December 19, 2011, 51:8-15.
[27] Deposition of Bryan Lisa, December 19, 2011, 47:18-25.
[28] Deposition of Dan Smith, May 16, 2013, 303:11-304:8.
[29] Id.

There are three (3) primary Ethicon procedures that govern the requirements for implementation of Risk Management[30]:

1. PR602-003 Procedure for Medical Device Risk Management [31]

This procedure defines the requirements for risk management activities as a systematic part of design risk management. The purpose of this procedure is clearly identified as "[t]his procedure will define the device design risk management system for evaluating device safety" and includes planning, setting risk criteria, identifying hazards, risk assessment, risk reduction and control. This procedure defines that a core team is typically used based on expertise to conduct risk assessments by means of a series of DDSAs. The procedure calls on the team to determine if all hazards are identified.

A key requirement of this procedure is that the DDSA must be reviewed and updated as new information becomes available. Specifically, the complaint database is to be reviewed and if a "discrepancy exists between the DDSA and Product Complaint database, an investigation into the root cause must be conducted."[32] Potential outcomes include repeating the analysis for the new hazards, educating the user, and changing the device design.

2. OP650-010 Operating Procedure for Device Safety Assessment (DDSA)[33]

This procedure defines how to conduct the DDSA for new or modified products. The DDSA is based upon the questions presented in the risk management standards used to identify system characteristics in its intended use environment that may affect safety[34] [35]. DDSAs are required at three (3) time points in the design cycle: during the concept phase, during product development, and a final report. The final design must be approved as safe prior to presentation to the Medical Affairs Director. All reports are to be filed in the DHF. Risk control plans were only required for risks determined to be of such significance risk to require risk reduction.[36]

3. OP650-011 Operating Procedure for Design Failure Modes and Effects Analysis (dFMEA)[37]

This procedure provides step-by-step instructions for conducting a dFMEA as a risk reduction technique for risks estimated to be controlled per the DDSA. At Ethicon, each of these rankings is on a scale of 1-10. A Risk Priority Number (RPN) is assigned by multiplying the rankings for severity, occurrence, and detection. Therefore, a RPN is between 1 and 1000. In accordance with OP650-011 where an RPN exceeds 294, a risk reduction must occur. A

[30] Each of these procedures were revised over time; therefore specific requirements associated with each document depends on the exact date in question.
[31] Eth.Mesh.08438584.
[32] Id.
[33] Eth.Mesh.10618465.
[34] EN 1441:1997 Section 3.2.
[35] ISO 13485:2001 Annex A.
[36] Eth.Mesh.10618501.
[37] OP 650-011, Version 1. Version 1 of OP650-011 does not contain a Bates Number. There are multiple versions of this Operating Procedure. Revision Six (6), Eth.Mesh.03742864, was a ""substantial re-write, which added the Application FMEA procedure.

Recommended Action Plan is required to evaluate the potential cause and effect.[38] During review of the risk management procedures, I found no rationale for selection of the RPN cutoff of 294 and therefore the relationship to an actual risk benefit decision remains unclear.

V. PROBLEMS WITH ETHICON'S TVT-O RISK MANAGEMENT PROCESSES

A. Risk Management System Failure

Ethicon's TVT-O device was launched in "early 2004" and utilized a mid-urethral positioning using a transobturator approach, rather than a retropubic approach.[39] I have reviewed books 1-7 from the Gynecare TVT-Obturator DH1019. Dan Smith, Ethicon's Corporate Representative regarding the design and development of the TVT-O device has testified that these documents comprise the TVT-O design history file.[40] My review of these and other Ethicon documents relating to the risk assessment procedures for the TVT-O device has revealed that there were problems with the TVT-O risk management process. My opinion is that Ethicon's risk assessment procedures for the TVT-O device did not adequately identify, analyze, and mitigate all known risks associated with the TVT-O device.

It is Executive Management's responsibility to "review the suitability of the risk management process at planned intervals to ensure continuing suitability and effectiveness of the risk management process" as part of the company's overall QMS.[41]

Rather than considering the TVT-O to be the "same" as the TVT-R because of the use of the same mesh, it is more important to look at the differences between the systems and ascertain what the appropriate risk management activities should be. Failure to properly assess the key differences between the TVT-R and TVT-O was a mistake. Key differences include:[42]

- Technique and point of fixation
- Implantation through the obturator membrane
- Mesh ends design to accommodate helical passer delivery instrument
- Needles not attached to mesh-helical passer delivery system used to deliver mesh

Ethicon's own procedure states that if a similar device system is used for the risk assessment instead of the actual device, the team must demonstrate that the changes that have been made to the system will not introduce significant difference in the results of the risk assessment. A comparison was to be made based upon a system evaluation of the design and function changes and the way they can influence various hazards.[43] This was not done when changing from the TVT-R to the TVT-O. Instead they relied on a retrospectively created dFMEA using a different surgical approach, different instruments and different attachment technique. Review of the seven

[38] Eth.Mesh.09893522.
[39] Eth.Mesh.03932909; Eth.Mesh.00259047.
[40] Deposition of Dan Smith, June 5, 2013, 860:3-862:2.
[41] ISO 14971:2000: Section 3.3 and ISO 14971: 2007: Section 3.2.
[42] Eth.Mesh.00259301.
[43] Eth.Mesh.08438972.

DHF volumes did not reveal a rationale for this decision. However, even had a rationale been provided, the 2001 dFMEA was inappropriate because it is based on pre-market data and contains contradictions and omissions.

TVT-O DDSA

The TVT-O DDSA was initially undertaken as a subsystem/ component in June- July 2003 with the scope to include "the helical passer and winged guided used in conjunction with the transobturator placement technique. The mesh implant with its sheath are used for currently marketed product."[44] No part of the mesh was included despite the fact that the attachment mechanism and delivery method had changed. The analysis team identified hazards and failure modes were evaluated and assigned a severity ranking as required per PR602-003 version 5[45]. The results of the analysis were summarized in a memo which stated that the "results of the exercise indicated all risk levels ranged from I to III, which are deemed acceptable with no further actions required."[46] All the required documentation was completed and approved. Since Ethicon deemed the risks to be acceptable, it performed no risk/ benefit analysis.

Since none of the risk levels were deemed to be a risk level of Risk IV or Risk V a dFMEA was not procedurally required under Ethicon's guidelines for the change in design from TVT-R to TVT-O. In my opinion, this is a gap in the risk management process and does not meet ISO 14971:2000 because:

- The scope is intended to be the "the medical device"[47] rather than components as conducted in the TVT-O DDSA
- The DDSA does not require any rationale for the rankings given (e.g. published standards, field data, complaint data or clinical evidence) for the hazard or foreseeable failure defined in the standard.[48]
- DDSA risk management process did not require a detailed analysis be conducted using the standard risk analysis techniques such as FMEA which requires each failure / fault mode to be "systematically identified and evaluated." [49]

In my opinion the lack of a systematic approach such as those defined in this section allows potential hazard, effects and system interactions to be overlooked and does not meet the standards in ISO 14971:2000.

Table 1 shows that the reliance on past documents continued. With each analysis looking at a small segment or subsystem. The system level TVT-O dFMEA was not completed which was the element that could tie together the many lower level analyses and transform the "exercise" into an effective process.

[44] Eth.Mesh.00259301.
[45] Eth.Mesh.08438961.
[46] Eth.Mesh.00259417.
[47] ISO 14971:2000 Section 3.5.
[48] Id. Section 4.4.
[49] ISO 14971:2000 Annex F.

Product	Risk Assessment Tool	Final Revision Date	Level	Author
TVT-R MCM	aFMEA	02/6/2000	system	Medscand Preventia
Packaging	DDSA	04/03/2000	component	Ethicon Gmbh
TVT-R MCM	dFMEA	05/18/2001	system	Ethicon Gmbh
TVT-O MCM/LCM	DDSA	12/15/2003	Subsystem/component	Ethicon Gynecare
TVT-O MCM/LCM	pFMEA	12/15/2003	component	JEB
TVT-O MCM/LCM	pFMEA	12/18/2003	component	Mediline
TVT-O MCM/LCM	pFMEA	12/19/2003	component	Ethicon Sarl
LCM	dFMEA	06/05/2006	Subsystem	Ethicon Gynecare
TVT-R[50]	aFMEA	09/09/2010	System	Ethicon Gynecare
LCM[51]	Risk Management Plan & Report	Multiple Revisions	Subsystem/ Component	Ethicon Gynecare
Legacy Devices[52]	Risk Management Plan & Report	Multiple Revisions 2006-2010	System	Ethicon Gynecare

Table 1: Risk Related Documents

Although many documents existed, none of them were tied together to show the overall risk to the end user. For a risk management system to function properly, all potential risks must be identified, analyzed, and then mitigated. As part of this system, risks which are identified in the dFMEA must be identified and controlled. Lack of a system level initial analysis or dFMEA with an associated aFMEA which fed back into the DDSA did not therefore address safety and performance. The continuous piecemeal approach and leveraging of prior work did not allow the risk management system to determine the true risk of the new system and surgical technique.

[50] TVT-R aFMEA and Legacy Reports are included in the Figure 4 and Tables 2 and 3 to show risk related documents for TVT-0 and LCM throughout the life of the product.
[51] Id.
[52] Id.

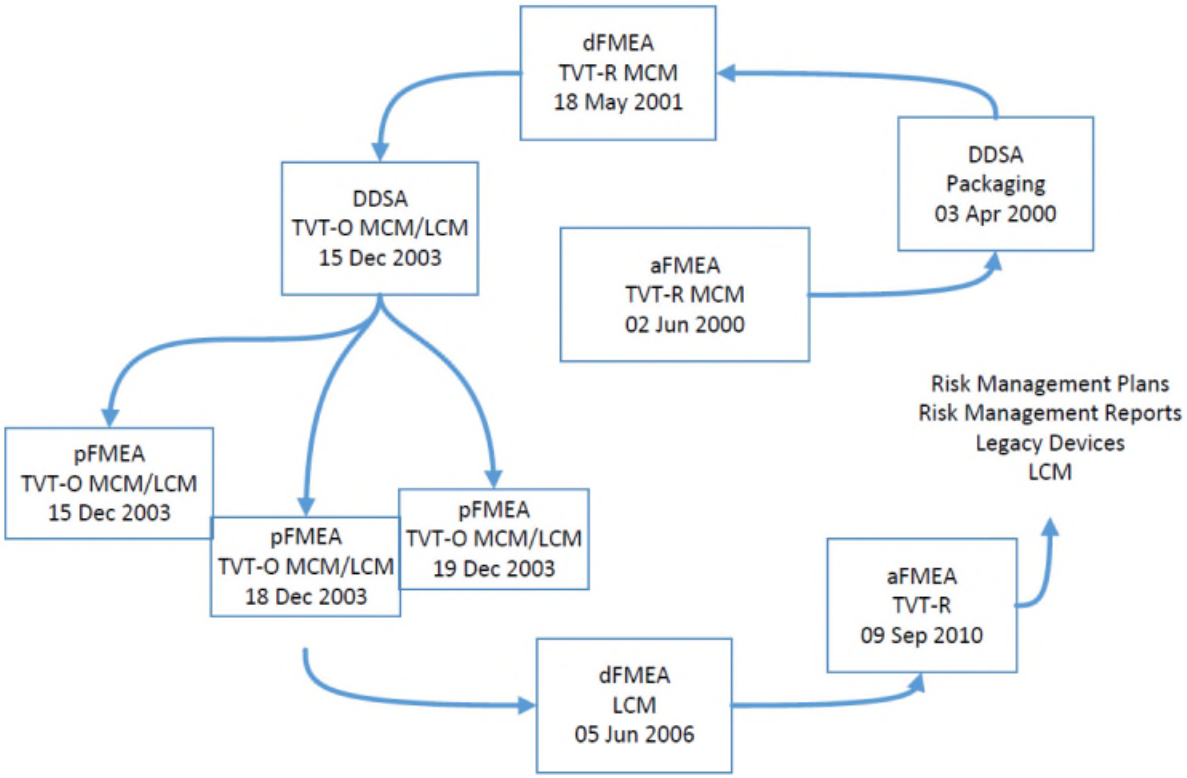

Figure 4: Risk Management Process Not Functioning According to Standards

My review of Ethicon documentation reveals that Ethicon did not properly identify and assess all known risks associated with the TVT-O device. By 2006, for the LCM dFMEA, there was a requirement in PR602-003 Rev.7[53] for Risk Management Reports (RMR) to summarize the findings of a FMEA. Once again the system is unsound in that only the only the critical risks with a "degree of impact" [54] of nine (9) or 10 are included in calculation of the overall residual risk calculation. The degrees of impact are defined as:

Ranking	Degree of Impact
9	Harm can be caused but User is aware of that Harm as or shortly after it occurs. In some cases remedial action can be taken to reduce/ eliminate long-term impact of Harm at that time.
10	Hazardous without warning. Harm can be caused but User is unaware of that Harm occurred at or shortly after it occurs.

[53] Eth.Mesh.03742571.
[54] Eth.Mesh.03742597.

Because Ethicon did not include all known risks in their overall residual risk calculation, many risks were not addressed and the overall risk calculation is artificially reduced. The documents were individually completed. Each team and project depended on the prior documentation. Each risk analysis should have rolled up into an overall system with functioning feedback loops which would have facilitated early discovery and elimination or mitigation of failures.

B. Risk Analysis Implementation Failure

Review of the FMEA Severity Ranking Scales from its inception at Ethicon in 1999 through 2009[55], indicates that the ranking has remained the same over time. Although the requirement has remained constant, the implementation differs substantially. As shown in Table 2, common hazards associated with use of the device are treated differently for each analysis (e.g. infection is rated from a three (3) meaning only an insignificant or negligible impact to a 10 meaning a catastrophic hazard. Damage to a nerve ranks between four (4) and (10). This inconsistent approach makes it impossible to compare the risk analysis results and does not permit proper actions to be taken.

The same pattern of inconsistently can be seen in Table 3, which exemplifies how failure modes were handled differently, over time, for each analysis. Examples include:

- Inadequate or incomplete labeling (IFU) was not considered as a potential failure for the dFMEAs or the 2010 aFMEA for the TVT-O despite the fact that the User Need requires the "labeling minimize the likelihood of improper use of instruments.[56] The associated Device Specification is that "the IFU clearly describes a surgical procedure in which the instruments. And thus the mesh, are placed starting from inside the vaginal/urethral space to the outside of the patient."[57]
- Mesh fraying/ roping was only considered in one of the Legacy Risk Management Report where it was concluded that regardless of the fact that fraying resulted in "no associated harm"[58] despite the fact the fraying/ roping was the category with the highest number of complaints[59] and known to be associated with urinary retention.[60]
- Mesh degradation was simply not considered as a potential failure mechanism even though Ethicon scientist, Thomas Barbolt, testified that it is Ethicon's position that degradation can occur and this was known by Ethicon as early as 1992.[61] Thomas Barbolt acknowledged Ethicon's internal studies have shown that the Prolene mesh is susceptible to degradation.[62]

Increased mesh stiffness was not included in the Legacy Risk Management Report or the 2010 aFMEA. This omission is startling since both internal testing showed that at one inch (1")

[55] OP650-011 Versions 1 through 7.
[56] Eth.Mesh.00259162.
[57] Id.
[58] Eth. Mesh. 10618768 and 10618803.
[59] Eth.Mesh.22012577.
[60] Eth.Mesh.01822361.
[61] Deposition of Thomas Barbolt, January 8, 2014, 409:1-13.
[62] Deposition of Thomas Barbolt, January 8, 2014, 516:21-517:4.

of stretch, the laser cut TVT was "about three times stiffer than the machine cut TVT mesh"[63] and the fact that published, peer-reviewed clinical literature agrees that stiffer meshes are associated with increased patient complications.[64] The 2010 aFMEA hazard of urinary retention was simply attributed to improper patient selection. Based on my review of Ethicon documents, it is my opinion that Ethicon's risk management process was not functioning properly because Ethicon's risk assessment tools, including the FMEA, were not applied consistently. Based on my review of Ethicon documents, it is my opinion that Ethicon's risk management process was inadequate.

[63] Eth.Mesh.01809080.

[64] *See* Dietz, H.P. et al. *Mechanical Properties of Urogynecologic Implant Materials*. Int. Urogynecol. J. (2003) 14: 239-243; Moalli, P.A., et al. *Tensile Properties of Five Commonly Used Mid-Urethral Slings Relative to the TVT*. Int. Urogynecol. J. DOI 10.1007/s00192-007-0499-1. (2007); Okulu, E. et al. *Use of Three Types of Synthetic Mesh Material in Sling Surgery: A Prospective Randomized Clinical Trial Evaluating Effectiveness and Complications*. Scandanavian J. of Urology. 2013; 47: 217-224;

Table 2 Hazard Table

Hazard	*aFMEA*	*DDSA & DFMEA*	*dFMEA*	*DDSA*	*dFMEA*	*DDSA Legacy*	*aFMEA TVT-R*
	TVT-R MCM	*Packaging Component*	TVT-R MCM[65]	*TVT-O MCM/LCM*	*LCM*	*TVT-R/ TVT-O MCM/LCM*	*MCM/LCM*
Infection	8	5 DDSA/ 10 dFMEA	Long / serious	3	10	10	10
Nerve damage	8	N/A	Long/ serious	4	Not included	9	9
Vaginal perforation/ damage	5	N/A	Long/ critical	3	Not included	10	Not included
Postoperative erosion	Not included	N/A	Long/ Critical	Not included	9	10	10
Treatment not successful- recurrence	4	N/A	Long/ Critical	Not included	7	Not included	Not included
Prolonged Urinary Retention	5	N/A	Long /Critical	Not included	Not included	Not included	10
Damage to bladder/ internal organs	9	N/A	Long/ Critical	Not included	9	10	10
Pain	8	N/A	Not included	Not included	7	9	9

[65] Severity and occurrence rankings do not follow OP650-011. Detection rankings are not utilized.

Table 3 Failure Mode Table

Hazard	*aFMEA*	*DDSA & DFMEA*	*dFMEA*	*DDSA*	*dFMEA*	*DDSA Legacy*	*aFMEA TVT-R*
	TVT-R MCM	*Packaging Component*	TVT-R MCM[66]	*TVT-O MCM/LCM*	*LCM*	*TVT-R/ TVT-O MCM/LCM*	*MCM/LCM*
Inadequate / Incorrect Labeling	Yes	No	No	Yes	No	Yes[67]	No
Tip/ Needle breaks off during procedure	Yes	No	Yes	Yes	No	Yes[68]	No
Mesh to needle or introducer Detachment	Yes	No	Yes	Yes	Yes	Yes[69]	No
Difficult Sheath removal -Separation	Yes	No	Yes	Yes	No	Yes[70]	No
Twist or kink in sheath/ mesh	No	No	No	Yes	No	Yes[71]	No
Fraying/ Roping	No[72]	No	No	No	No	Yes[73]	No
Mesh degradation	No	No	No	No	No	No	No
Mesh too stiff/ too flexible	No	No	Yes	No	Yes	No	No
Mesh Elongation	No	No	Yes	No	No	No	No

[66] Severity and occurrence rankings do not follow OP650-011. Detection rankings are not utilized.
[67] Eth. Mesh. 101618768.
[68] Id.
[69] Id.
[70] Id.
[71] Id
[72] Eth.Mesh.01317523 Refers to particles from mesh.
[73] Id.

1. 2004 Post-Implementation Complaint Review

A TVT-O post-implementation complaint review was conducted in August of 2004 to review the performance of the TVT-O system. Again complaints are simply attributed to areas other than design and not actions were required.[74] Complaints relating to mesh fraying, difficult sheath removal, mesh breakage, sheath splitting, lower extremity pain and urinary retention were simply accepted as a TVT-R issue rather than investigated and complaints directly attributable to TVT-O processes were including detachment/ pull out were not fed back into the supplier pFMEAs for improvement. It was documented that because the risks were included in risk analysis that no actions were required.[75] Since all risks were considered acceptable without the requirement to implement risk control measures during the TVT-O DDSA analysis, the problems were allowed to continue. The Ethicon risk management procedures and their implementation violated the international standards in place at the time.[76]

2. 2006 Complaint Review

Ethicon conducted a second complaint review on the TVT-O on February 23, 2006, for dates August 2003 through January 2006. [77] The top eight (8) complaint categories that accounted for approximately 65% of the complaints were:

a) Mesh Fraying/Roping
b) Sheath Damage
c) Pain
d) Infection
e) Mesh Separation
f) Recurrence
g) Introducer Damage
h) Seal Damage

With the introduction of TVT-O to the market, new risks were introduced to patients. For example, there is Ethicon documentation from at least 2009 which indicates that the TVT-O device may specifically be affecting active women differently.[78] In my review of the TVT-O DHF and other Ethicon documentation regarding the design and development of the TVT-O, I have seen no evidence that this risk was considered by Ethicon. At the very least, Ethicon should have identified and analyzed this risk as part of the design and development of the TVT-O device. There is no evidence that Ethicon took action to mitigate or follow-up on the root cause of this increased risk associated with the TVT-O device in active women.

[74] Eth. Mesh. 00259447.
[75] Id.
[76] ISO 14971:2000.
[77] Eth.Mesh.02319312.
[78] Eth.Mesh.04050265 (Noting that "The second source of the pain comes from the presence of tape in the adductors….This is of specific importance in young, active and/or sportive patients.").

Ethicon, as part of the World's largest medical device company, had the resources and access to expertise necessary to perform these functions. And in my experience, even small start-up medical device companies can, and often do, call on consultants like me to address risk management and implement corrective actions. It is not the industry norm to wait on others to collect and analyze the risk profile of a medical device that is (1) new to the market (and called "revolutionary" by the company); (2) placed near vital organs; and (3) permanently implanted.

3. Deficiencies with Ethicon's Legacy Risk Assessment

Ethicon conducted other risk assessments during the life of the TVT-O product that were also deficient. Analyses of "Legacy Devices" which included both the TVT and TVT-O devices were conducted in 2007 and 2008 respectively.[79] This was an effort to remediate the risk management files for devices released prior to January 31, 2005, for devices that had not gone through an ISO 14971 risk management process. The TVT-O met the definition and was included in the review process. Executive Management was required to address known hazards, remediate them or change the labeling to address the severity, duration and frequency of the harm. However, this was not done.

The "Legacy" risk remediation effort was fundamentally flawed for the TVT-O based on Ethicon's assumption that products with varied designs (mechanical and laser cut), and varied surgical approaches (retropubic and transobturator) could be grouped together and analyzed as one.[80] Both Industry Standards[81] and Ethicon DDSA procedures[82] require that the complaint start its analysis by looking at the intended use of the device and how it is to be implanted and placed. Multiple surgical methods cannot be analyzed together in a risk remediation, nor can multiple design types, since each combination of surgical technique and design characteristics yield a distinct risk profile that must be analyzed individually.

Ethicon inappropriately leveraged risk management documentation from one device to another. For example, the 2010 TVT Technical File combines risk analysis for the original TVT retropubic mechanically cut device along with the TVT-Exact, despite the fact that the TVT Exact is a different device using a different surgical technique that is only offered exclusively with laser cut mesh.[83] These risk management reports for the legacy TVT and TVT-O products include post marketing surveillance data from both laser cut and mechanically cut mesh, without separating out the adverse event rates and risk profile between the two products.[84] Without such an analysis, potential risks could not be properly mitigated through the design process.

Regardless of the fact that the "Legacy" systems were analyzed together, Ethicon still did not address several of the top the 11 known hazards identified in the 2002 complaint analysis or the 2006 complaint analysis. In fact, discussion notes from the team in charge of reviewing complaints for the Legacy Risk Management Report indicate that there is "no associated harm"[85] with many complaints including lower abdominal pain, broken, frayed or kink mesh or vaginal exposure/ extrusion." The resulting Legacy Risk Management Report concludes after review of complaint data that despite the flawed risks analyses, no updates to the aFMEA or dFMEA were

[79] Eth.Mesh.10618726.
[80] Eth.Mesh.10618757.
[81] EN: 1441: 1997, ISO 14971:2000 and ISO 14971:2007.
[82] Eth.Mesh.08438590.
[83] Eth.Mesh.22404550.
[84] Eth.Mesh.10618767; Eth.Mesh.10618794.
[85] Eth.Mesh.10618768.

required.[86] Additionally, since the residual risk was determined to be "moderate," Ethicon did not perform a risk benefit analysis. Also, based on limited information reviewed to date, the risks were not "moderate." Instead, life altering changes are reported, even in internal Ethicon documents. This is a major risk when dealing with permanently implantable devices near vital organs.

VI. CRITICAL RISKS IGNORED BY ETHICON

Despite adherence to a strict design control process and inclusion of harms in the risk analyses, the lack of proper checks and balances on the risk management process jeopardizes patient safety. In this case, the data reviewed demonstrates that Ethicon's QMS does not ensure that the proper use of risk management processes have addressed several known risks associated with the TVT-O device even to this day.[87] Had the QMS's risk management processes been properly implemented for the device, the risks should have been addressed and therefore minimized. These known risks and/or failure modes include, but are noted limited to:

1) Polypropylene's susceptibility to *in vivo* degradation;
2) Mechanically Cut TVT-O Mesh's susceptibility to roping, curling, and deforming;
3) Mechanically Cut TVT-O Mesh's susceptibility to fraying and particle loss;
4) The inability to remove the TVT-O device;
5) Laser Cut TVT-O Mesh's stiffness.

1. Polypropylene's Susceptibility to *In Vivo* Degradation

Before the launch of the TVT-O device, it was known both in the industry[88] and within Ethicon that the Prolene® material from which the TVT-O is manufactured degrades over time. A series of internal reports on the outcomes associated with implantation of Prolene® sutures in human and canine explant studies were documented from 1983[89] through 1992.[90] It was shown as early as 1983 that cracking occurred and documentation of these studies revealed that "it is obvious that the severity of cracking is related to the implantation time."[91] Additionally, the studies concluded the polypropylene "appears to be degraded in an oxidative fashion."[92] Furthermore, Ethicon scientist, Thomas Barbolt, testified that it is Ethicon's position that degradation can occur and this was known by Ethicon as early as 1992.[93] Thomas Barbolt acknowledged Ethicon's internal studies have shown that the Prolene mesh is susceptible to

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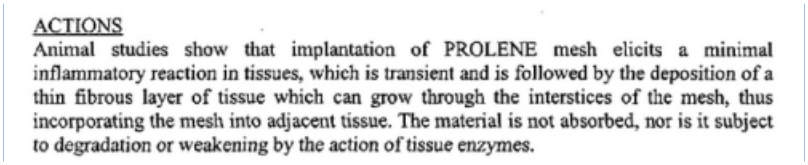
[86] Eth.Mesh.08438590.
[87] The clinical implications of each of these complaint categories are discussed by medical physicians in other expert reports submitted in this litigation. I offer no opinions on the clinical implications or the frequency of any of those complications throughout the population in this report. Similarly, I offer no opinions on the material properties of the polypropylene mesh used by Ethicon in its TVT-O as those are discussed by other experts for the Plaintiffs in this litigation. Instead, this report deals with whether Ethicon used the knowledge of the complaints it received – both clinical and material / device failures -- to mitigate risks posed by the device design in conformity with Industry Standards and its own SOPs.
[88] Eth.Mesh.05845592.
[89] Eth.Mesh.15958410.
[90] Eth.Mesh.12831391; Eth.Mesh.12729337; Eth. Mesh.07690752.
[91] Eth.Mesh.15958412.
[92] Eth.Mesh.12831392.
[93] Deposition of Thomas Barbolt, January 8, 2014, 409:1-13.

degradation.[94] Moreover, several peer-reviewed published articles have reported that polypropylene material may be susceptible to degradation after implantation in the body.[95]

Within the context of Risk Management, it is evident that material degradation was not considered as a hazard which, over time could lead to mesh embrittlement, cracking, and loss of mechanical strength within the patient. In fact, contrary to what was known internally, the following was allowed to transpire:

a) The Instructions for Use (IFU) supplied with each device stated that the material is not subject to degradation as shown in **Figure 6** below[96] which is directly contrary to what was known[97].



ACTIONS

Animal studies show that implantation of PROLENE mesh elicits a minimal inflammatory reaction in tissues, which is transient and is followed by the deposition of a thin fibrous layer of tissue which can grow through the interstices of the mesh, thus incorporating the mesh into adjacent tissue. The material is not absorbed, nor is it subject to degradation or weakening by the action of tissue enzymes.

Figure 6 Instructions for Use

In my opinion, prevention of harm or physical injury to the health of people from degradation of the Prolene in the TVT-O was not the focus of risk analysis as it should have been. Unless prevention of hazardous situations is firmly established, the risk management process will turn into an exercise only to meet market requirements rather than ensuring a dynamic process of continual improvement to the product to protect patient safety.

2. Mechanically Cut TVT-O Mesh's Susceptibility to Roping, Curling, and Deforming

Ethicon documents state that the MCM Prolene® mesh in the TVT-O is known to "curl" or "rope" under tension. In 2006, an Ethicon Engineer, Gene Kammerer, made a presentation which showed that the MCM (used in the TVT and TVT-O) has been shown to rope, curl and deform when under tension.[98] Gene Kammerer's presentation showed particle loss, fraying, degradation, roping, and deformation when the MCM was stretched, compared to LCM.[99] Dan Lamont testified that MCM "had the potential for degradation, particles floating around inside women's bodies, stretching, and roping…"[100] However, the final Risk Management Report (Legacy) showed that curling/roping was not addressed for the TVT-O device. Thus the completion of the complaint analyses and Risk Management Plans and Reports do not appear to

[94] Deposition of Thomas Barbolt, January 8, 2014, 516:21-517:4.
[95] *See* Clave et al. *Polypropylene as a Reinforcement in Pelvic Surgery is not Inert: Comparative Analysis of 100 Explants*. Int. Urogynecol. J. 21:261-270 (2010); Wood, A.J., et al. *Materials Characterization and Histological Analysis of Explanted Polypropylene, PTFE, and PET hernia meshes from an Individual Patient*. J. Mater. Sci. Mater. Med. 24(4): 1113-1122 (2013); Costello, C.R. et al. *Materials Characterization of Explanted Polypropylene Hernia Meshes.* J. Biomed Mater. Res. Part B: Appl. Biomaterials. 83B: 44-49 (2007).
[96] Eth.Mesh.10618786; Eth.Mesh.02340902.
[97] Eth.Mesh.12831392.
[98] Eth.Mesh.08334244; Eth.Mesh.08334245.
[99] Id.
[100] Deposition of Dan Lamont, September 11, 2013, 30:18-24.

have driven Ethicon to eliminate situations causing patient harm from roping, curling and distortion of the mesh shape.

3. Mechanically Cut TVT-O Mesh's Susceptibility to Fraying and Particle Loss

a) Fraying was known to be an issue in the design of the MCM prior to the introduction of the TVT-O product

Fraying was known to be an issue in the design and construction of the MCM prior to the introduction of the TVT-O product.[101] In fact, the initial TVT retropubic aFMEA completed in 1998 , and apparently reviewed and approved in 2000, mentions that a failure mode is "particles from Prolene mesh falls off into the tissue."[102] This risk analysis for the MCM TVT retropubic product further notes that the effect of this failure mode is "no effect. Implantable material."[103] Additionally, the 2002 complaint analysis indicated that there were 31 documented complaints for mesh fraying.[104] However, the severity ranking in both the aFMEA and in the complaints analysis was determined to be a "1" which is defined as "no effect" in the aFMEA and not perceptible or noticeable[105] in the complaint analysis.

b) Ethicon concluded that the fraying and particle loss associated with the MCM would not have any clinical significance, without performing any testing

In 2001, Dr. Alex Wang, "one of the most experienced TVT users in the world," reported problems with frayed mesh.[106] However, Dr. Martin Weisberg, an Ethicon Medical Director, concluded that the mesh fraying would be unlikely to have any clinical significance.[107] Dr. Weisberg testified that although he did not actually know whether frayed mesh leading to particle loss would have clinical implications, he does not recall whether he or anyone else at Ethicon studied the issue.[108] In 2003, Dr. Weisberg reported that there had been a total of 58 complaints of fraying with the MCM TVT since introduction in 2000.[109] Dr. Weisberg noted that when the mesh frays: "[T]he mesh elongates in places, the mesh narrows in places; and small particles of Prolene might break off… and that [s]tretching of the mesh increases the probability of fraying."[110] However, Dr. Weisberg concluded that "since fraying does not affect the safety and efficacy of the TVT device, it has been determined not to pursue any corrective action at this time."[111] Dr. Weisberg concludes that there is no reason to expect the particles to create a safety risk because it is made of the same Prolene® that has been tested as biocompatible in sutures.[112] Dr. Weisberg confirmed during his deposition that no corrective action was taken.[113]

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[101] Eth.Mesh.00541379.
[102] Eth.Mesh.01317523.
[103] Id.
[104] Eth.Mesh.01317514.
[105] OP650-011 Version #1, p21.
** Eth.Mesh.03905472.
[107] Id.
[108] Deposition of Martin Weisberg, May 31, 2013, 469:23-470:16.
[109] Eth.Mesh.00541379.
[110] Id.
[111] Id.
[112] Id.
[113] Deposition of Martin Weisberg, May 31, 2013: 469:23-470:16.

Moreover, Dan Smith, Ethicon's Corporate Representative for the design and development for Ethicon's SUI products, acknowledged at his 30(b)(6) deposition that he is not aware of any studies to determine whether or not the particles that fall off the MCM caused any problems or issues from a clinical standpoint.[114] Ethicon's failure to investigate the clinical implications of a known defect, such as the tendency of the MCM mesh to fray and lose particles inside the body violates industry standards and practices and can jeopardize patient safety.

In 2004, Ethicon continued to receive complaints about fraying and particles falling away from the mesh.[115] Dan Smith, the lead engineer for the TVT-O device, noted that the particle loss was further revealed when the mesh became available in a blue color.[116] Dan Smith noted that: "This is not going away anytime soon and competition will have a field day, major damage control offensive needs to start to educate reps and surgeons UPFRONT that they will see BLUE shit and it is OK."[117] A November, 2004 Ethicon email reveals that, one of the "top 3 complaints" included "mesh frayed."[118] Dan Lamont, an Ethicon Quality Engineer who was the Lead Quality Engineer on the LCM product,[119] acknowledged that at this time (November 2004), "so far there is no official corrective action set up in Neuchatel" where the mesh was cut.[120] The same November 2004 Ethicon email noted that "the root cause of this phenomenon are known: the way to cut the mesh (blade cutting). If we change the way to cut the mesh (ultrasonic or laser cutting) it seems we can limit the mesh frayed defect significantly…"[121] In 2003, a published study by Dr. Pariente concluded that "the very high particle shedding for both Sparc (AMS) and TVT (Ethicon) may be of significant long term clinical concern in some quarters."[122] Dr. Pariente's study showed TVT particle loss as high as 8.5%.[123] Dan Lamont admitted that the fraying of the mesh was a "defect" of the mesh".[124]

Mesh fraying and particle loss was handled in a similar manner as roping and curling from a risk management point of view. The final Risk Management Report (Legacy) showed that mesh fraying was noted as "no associated harm" by the risk team and not addressed for the TVT-O device. The critical and required actions to address the increase in severity resulting from particle release was omitted. Although additional complaints are noted after implementation of the blue Prolene®, from the risk management documents it appears the team continued to handle the complaints as primarily a "cosmetic" issue rather than a hazard causing significant patient harm. Furthermore, documents from August 17, 1998,[125] acknowledge that the release of small fibers from the knitted structure was identified as a product characteristic to be improved when re-designing the future mesh products; however the TVT-O product was not intended to be part of the mesh improvement. To my knowledge and based on my review of Ethicon documentation, this harm to patients was not properly mitigated.

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[114] Deposition of Dan Smith, June 4, 2013, 664:22-665:10.
[115] Eth.Mesh.00863391.
[116] Id.
[117] Id.
[118] Eth.Mesh.01813975; see Deposition of Dan Lamont, September 11, 2013, 10:16-11:21.
[119] Deposition of Dan Lamont, September 11, 2013, 30:18-24.
[120] Deposition of Dan Lamont, September 11, 2013, 11:22-12:2; Eth.Mesh.01813975.
[121] Deposition of Dan Lamont, September 11, 2013, 12:18-13:21; Eth.Mesh.01813975.
[122] Eth.Mesh.01221055.
[123] Id.
[124] Deposition of Dan Lamont, September 11, 2013, 15:16-16:10.
[125] Eth.Mesh.09264945.

4. Difficulty of Removing the TVT-O Device

There are a number of reasons a permanent implant may need to be removed or replaced. The device could fail to perform its intended function or result in one or more of the harmful situations defined in this section ("Critical Risks Ignored by Ethicon"). Additionally there could be other medical complications that necessitate removal of the device in full or in part.

Ethicon's former Medical Director, Piet Hinoul, has acknowledged that "once the TVT is incorporated into the body, if a complication is resulting from the TVT's presence within the body" it "can be very difficult to treat at times because of the fact that it's permanently incorporated into the tissue."[126] Piet Hinoul further testified that "removal of the mesh, because you get tissue ingrowth, can prove to be a challenge."[127] Ethicon Medical Director, David Robinson, also acknowledged that physicians have had difficulty removing the TVT device.[128]

Nevertheless, the current IFU for the TVT-O device reveals that "Prolene Mesh is a permanent implant that integrates into the tissue. In cases in which the Prolene Mesh needs to be removed in part or whole, significant dissection may be required."[129] Additionally, the TVT-O device is placed in a mid-urethral position in the body using a transobturator approach, rather than the retropubic approach which is used in the predecessor TVT-R device.[130] Ethicon did not address whether the new surgical approach would make removal more difficult in the TVT-O risk assessment documentation. Despite this, it appears no steps were taken to provide a tool or redesign (e.g. a different mesh property) that would allow for easier removal of the device. In addition, if removal surgery could do more harm than good, then this additional risk needed to be taken into account. The presence of the mesh creates more harm than good. The inability to remove the mesh may create more harm than good. If so, these additional risks must be taken into account by Ethicon.

5. Laser Cut TVT Mesh's Stiffness May Lead to Patient Complications

a) Ethicon continued to sell the MCM after LCM was on the market

[126] Deposition of Piet Hinoul, January 13, 2014, 807:3-18 (Q. –once it's been incorporated into the body, you can't simply adjust it. You'd have to actually cut into it and move—and remove part of the tape, correct? A. Sometimes people try to loosen it, but I would just say—I would agree with you, it's not designed to be readjust able post-replacement. Q. Once—I'm sorry. Once the TVT is incorporated into the body, if a complication is resulting from the TVT's presence within the body that can be very difficult to treat at times because of the fact that it's permanently incorporated into the tissue, correct? A. That is correct.") and Deposition of Piet Hinoul, January 13, 2014, 809:11-810:1 (Q.—and then later an infection occurs, there can be difficulty removing the infected mesh, right? A. In that sequence of events, yes. Q. If mesh has been fully integrated and then an erosion occurs, it can be difficult to remove the full amount of the mesh that you want to remove. You may be able to get the part that's exposed into the vagina— A. Right. Q. –but when you want to get deeper into the tissue that can be difficult, correct? A. Yes...").

[127] Deposition of Piet Hinoul, June 27, 2013, 578: 15-22 (Q. If a patient has a complication that is chronic pain or pain with sex or another complication and the mesh is removed, can that be very difficult?..A. Yes. Removal of the mesh, because you get tissue ingrowth, can prove to be a challenge.").

[128] Deposition of David Robinson, July 24, 2013, 181:12-18 ("So, physicians within the United States it looks like from these complaints were having difficulty inserting or difficulty removing the device, at least the physicians who were making these complaints.? A. Well, there were complaints of such, yes.").

[129] TVT-O IFU (http://www.ethicon.com/healthcare-professionals/ifu).

[130] Eth.Mesh.00259047.

In in the fourth quarter of 2006, Ethicon began offering LCM in addition to the existing MCM.[131] Ethicon announced that this change would affect both the TVT-R and TVT-O product lines.[132] Ethicon announced that this change was made to "gain efficiencies in manufacturing processes" while also noting that laser cutting would "reduce particulate loss as well as the potential for mesh fraying."[133] According to an April 18, 2006, Clinical Expert Report for the Laser Cut Mesh "on average, the mechanically Cut mesh lost approximately twice the number of particles as the Laser Cut mesh."[134]

Both Ethicon's MCM and LCM have problems associated with them. Despite Ethicon's knowledge of problems with the MCM, Ethicon continued to market MCM devices even after the LCM mesh was launched. According to Dan Lamont, Ethicon's Quality Engineer for the LCM project, Ethicon chose to continue to sell the MCM despite knowing that it had the potential for degradation, particles loss, stretching, and roping.[135]

b) LCM is stiffer than MCM

The LCM had substantially different physical properties than the MCM, as the LCM was stiffer. In March 2006, Gene Kammerer presented results regarding elasticity testing of LCM and MCM which showed that LCM was less elastic than MCM: "MCM meshes stretch between 55.8% and 33.4%. The LCM meshes stretch between 39.5% and 32.1%."[136] Additionally, a December 14, 2004, Ethicon memo found that at one inch (1") of stretch, the laser cut TVT was "about three times stiffer than the machine cut TVT mesh."[137] However, Ethicon decided against conducting clinical testing to establish the safety and effectiveness of the devices affected by using the LCM.[138] Relying on the performance of a different product (TVT-O MCM) and assuming the new product or change in manufacturing of the material is safe is not consistent with industry norms.

The risk in changing the way the material is made is that it may change its properties and affect patient safety. For example, the LCM dFMEA notes that if a mesh is too stiff it can cause the following harms: "Harm: Pain, Damage to Urethra, Urethral Impingement, Damage to Bladder."[139] Ethicon documentation has revealed that stiffer meshes may lead to complications in patients.[140] Moreover, published, peer-reviewed clinical literature agrees that stiffer meshes are associated with increased patient complications.[141] Despite Ethicon's knowledge that a mesh

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[131] Eth.Mesh.00167119.
[132] Id.
[133] Id.
[134] Eth.Mesh.00167104.
[135] Deposition of Dan Lamont, September 11, 2013, 30:18-24.
[136] Eth.Mesh.00302181.
[137] Eth.Mesh.01809080.
[138] Eth.Mesh.00167104 (April 18, 2006 Clinical Expert Report for Laser Cut Mesh).
[139] Eth.Mesh.01218019 (dFMEA for Laser Cut Mesh); Eth.Mesh.22012565 (Technical File Amendment—Laser Cut Mesh.)
[140] Eth.Mesh.02185584; Eth.Mesh.08968369; Eth.Mesh.08969368; Eth.Mesh.04077109; Eth.Mesh.08041930.
[141] *See* Dietz, H.P. et al. *Mechanical Properties of Urogynecologic Implant Materials*. Int. Urogynecol. J. (2003) 14: 239-243; Moalli, P.A., et al. *Tensile Properties of Five Commonly Used Mid-Urethral Slings Relative to the TVT*. Int. Urogynecol. J. DOI 10.1007/s00192-007-0499-1. (2007); Okulu, E. et al. *Use of Three Types of Synthetic Mesh Material in Sling Surgery: A Prospective Randomized Clinical Trial Evaluating Effectiveness and Complications*. Scandanavian J. of Urology. 2013; 47: 217-224;

that is too stiff can cause painful complications, Ethicon continued to sell this mesh to patients and did not warn of these complications. Ethicon's continued marketing of the LCM TVT mesh violated industry standards and practices and jeopardizes patient safety.

Additional internal documentation on laser cut mesh supports my opinion that it is a deviation from the standards to leverage the performance of old material (MCM) to new material (LCM). Moreover, Ethicon documentation reveals that Professor Carl Gustaf Nilsson, an Ethicon consultant who has published a study on the TVT Retropubic device,[142] has noted that he "[w]ill not use Laser cut mesh."[143]

VII. ETHICON MANAGEMENT DID NOT UPDATE THE TVT DEVICE'S WARNING INFORMATION, DESPITE KNOWLEDGE OF PRODUCT COMPLICATIONS

As I have explained above, Ethicon's management had a responsibility to evaluate and assess product complaints regarding the TVT-O device and then incorporate that information into the design of the device, including the physical design, protective measures and/or changes to the device labeling. There must have been documentation of the response to these complaints. Ethicon documentation and testimony reveals that Ethicon's management were alerted by Meng Chen, Ethicon's Medical Director and Safety Surveillance Director, who testified that she "repeatedly observed" complaints of "dyspareunia" in reports regarding Ethicon's TVT family of products.[144] Meng Chen acknowledged that "because of the frequency with which" she saw dyspareunia, she "alerted some of [her] superiors at the company and made them aware of that."[145] Ethicon documentation reveals that after reading patient complaints relating to Ethicon's TVT family of products, Meng Chen wrote an email to Ethicon Management, including Mark Yale, the head of Ethicon's Quality Engineering and Risk Management department at that time, in which she stated "[o]ur post-market knowledge with these products are much more than what we have in the IFUs for all three types of TVTs…My reason for bringing this point to you is maybe you may be able to look into it from senior management perspective and to facilitated the IFU updated for all three TVTs, particularly in the area of 'Potential Adverse Reactions.'"[146] Meng Chen testified at her deposition, that since she brought a "medical doctor's perspective" she had a perspective that that senior management may not have.[147] Meng Chen further testified that updating the IFU to a level that reflected the current knowledge of the manufacturers on the potential adverse reactions associated with the TVT products was crucial because this would allow physicians to "conduct a more thorough and more effective preoperative risk-benefit consent."[148] Ethicon management never addressed these issues raised by Meng Chen. Ethicon management's inaction on this issue, as required by the foregoing design standards, fundamentally ignored patient concerns and the safety of this permanently implantable device. As explained in this report, this started from the very beginning of the acquisition of the device,

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[142] *See* Nilsson, C.G. et al. *Seventeen Years' Follow-Up of the Tension-free Vaginal Tape Procedure for Female Stress Urinary Incontinence*. Int. Urogynecol. J. DOI 10.1007/s00192-013-2090-2 (2013).
[143] Eth.Mesh.04048515.
[144] Deposition of Meng Chen, October 29, 2013, 121:13-19.
[145] Deposition of Meng Chen, October 29, 2013, 121:21-25.
[146] Eth.Mesh.04092868; Deposition of Meng Chen, October 29, 2013, 189:13-190:21.
[147] Deposition of Meng Chen, October, 29, 2013, 191:23-192:2.
[148] Deposition of Meng Chen, October, 29, 2013, 201:20-202:10.

through its early development and after it was released to market. Well-recognized international standards for quality management systems and Ethicon's own internal guidelines were not effectively performed to put patient safety first by effectively planning for and mitigating risk. That is fundamentally part of a safe and effective design. Unfortunately, neither the design standards nor their internal procedures were followed for the TVT-O system.

VIII. COMPENSATION

The compensation per hour which I expect to be paid for my review, study, and testimony is as follows: $365.00 per hour for review and study, expert report, deposition and trial testimony time.

IX. LISTING OF CASES IN WHICH TESTIMONY HAS BEEN GIVEN IN THE LAST FOUR YEARS

Arthrex, Inc & Arthrex Manufacturing Inc. vs Parcus Medical, LLC

Mullins et al. v. Ethicon, Inc.

X. EXHIBITS:

1) Anne H. Wilson Curriculum Vitae
2) ISO 14971 Flow Chart
3) Facts and Data Considered

Anne Holland Wilson

Digitally signed by Anne Holland Wilson
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Date: 2016.01.30 13:47:39 -06'00'